

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE JAN 2007		2. REPORT TYPE		3. DATES COVERED 00-00-2007 to 00-00-2007	
4. TITLE AND SUBTITLE Armor Testing, An Example of T&E for Rapid Acquisitions				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Aberdeen Test Center,,Aberdeen Proving Ground ,MD,21005				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 3	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

Armor Testing, An Example of T&E for Rapid Acquisitions

COL John P. Rooney, USA

U.S. Army Aberdeen Test Center,
Aberdeen Proving Ground, Maryland

Testing in support of rapid acquisition is a process that sometimes comes without fully defined requirements and represents the Army's daily adaptation to battlefield realities. It is characterized by a responsive test process, streamlined decision making, and the need for test resources to already be in place to allow for rapid execution. Effort must be spent to fully characterize significant aspects of the operational environment and to continuously examine them to ensure that they remain relevant. The results must be repeatable and capable of withstanding intense scrutiny. In the fervor to provide something immediately, caution must be exercised to ensure that the solution is not worse than the problem, that is, *something* isn't always better than *nothing*.

My involvement with rapid acquisition can be traced to August 2003 when MG Robert Armbruster, USA, then-commander of the Army Test and Evaluation Command (ATEC), Alexandria, Virginia, called a meeting to address armor protection systems. This was about two months into my assignment as chief of staff of the Developmental Test Command (DTC), Aberdeen Proving Ground (APG), Maryland, and I was the DTC representative to the meeting, which also included the Army Evaluation Center (AEC), Program Managers (PMs), Army G-3 (operations) and G-8 (analysis), as well as the National Ground Intelligence Center (NGIC). Fewer than 300 of the high-mobility multipurpose wheeled vehicles (HMMWVs) in theater were up armored. With improvised explosive devices (IEDs) and other threats, the imperative was to get them up armored immediately. The purpose of the meeting was to

define the threat; develop ideas for how to protect the vehicles; and define the required level of protection. Two issues were addressed: (1) Protection against the appropriate threats in theater; and (2) Automotive performance consequences of up armoring these vehicles.

The outcome from the meeting was a test concept describing what could be accomplished immediately that would add value to the acquisition process. It was briefed to MG Armbruster, who subsequently approved the idea and assigned me as the action officer, and then chair of the ATEC Systems Team (AST) for Characterization of Armor Protection Initiative for Vehicles. This enabled me, as someone onsite where all the armor testing was taking place, to rapidly provide emerging results of armor testing to senior leadership in support of acquisition decisions.

A data call was issued for armor protection with ATEC tasked to test the ideas. The approach was to perform rapid screening ballistic testing on 2-foot x 2-foot material coupons. The coupons were

exposed to bullets and fragments to characterize performance. The results provided a comparative basis for choosing those with protection potential. Once suitable materials were identified, suppliers were requested to deliver two complete kits (HMMWV only at first): a ballistic test kit and an automotive test kit, for determining capabilities and limitations to permit a go/no-go decision to be made. Candidates passing these tests were then used for exploitation—testing seams, bolts and so forth—where potential weaknesses could occur. There were also full-up live fire shots using the appropriate threats to assess the integration of the solution on the vehicle.



COL John P. Rooney, USA

In parallel with these tests, automotive performance was examined to assess changes in vehicle performance due to up armoring, for example, steering and handling, side slope, braking and limited reliability-availability-maintainability (RAM). These tests established the new handling characteristics and the capacity of the chassis to support the additional weight.

Keep in mind that there was little experience in the Department of Defense (DoD) with putting armor on tactical wheeled vehicles. The M1114 was designed primarily for a very different threat than was present in Iraq and Afghanistan. Testing had to be conducted on a relative comparison basis—there was no other choice. All samples were exposed to identical threats.

By mid-October 2003, the first shots were completed, leading to development of two up armor kits: one from the Army Research Laboratory (ARL) and the other from ARL and the Army Tank-Automotive and Armament Research, Development and Engineering Center (TARDEC). By late October 2003, about 2,000 ARL and ARL-TARDEC kits were shipped to theater. From then on, the work was constant, examining new ideas and adapting to changing threats. Throughout 2004 and 2005, this same process was followed, and the full range of trucks was tested, in addition to continually upgrading the up armor kits as the threats changed. There have been in excess of 460 options tested to date (December 2006) from 76 vendors.

In 2005, I was assigned command of the Aberdeen Test Center (ATC), APG, which has primary responsibility for testing the up armor concepts. ATC is the DoD lead test center for automotive testing, manned and unmanned ground vehicles, guns and munitions (direct fire and small arms) testing, and live fire vulnerability and lethality testing. Along with colleagues at ARL, AEC and DTC (all at Aberdeen Proving Ground) these are the vulnerability, ballistics and survivability experts for the Army.

Once the initial kits were developed and shipped, and with the morphing threat, the natural question became: “Were our tests duplicating what was really happening in theater with the evolving IED threat?” In April 2004, BG Joseph L. Votel, USA, and I went to Iraq with the IED Task Force and Coalition

Explosives Exploitation Cell to examine data on what was really happening and to determine how to adapt the testing to be more representative. Only small changes to the test scenarios were required based on information gathered from the trip.

Rapid acquisition by its very nature does not follow the path of a traditional test program. Operational concepts are often developed concurrently with fielding; there may be limited time for formal operational testing; and evaluation must identify the capabilities and limitations of the solution. To mitigate the risk, ATEC established Forward Operational Assessment (FOA) teams, which consisted initially of military operational testers and evaluators and have recently added civilian developmental testers. The team members are subject matter experts that have the ability to conduct limited tests and operational assessments in theater with a direct line of support for testing and follow up at the test centers.

One example of such a limited test was conducted on tactical vehicles to assess how they are being used in theater compared to how they were tested against the military standards. Twenty tactical vehicles were instrumented, and we learned that in theater, they are accumulating more miles at high speed and are experiencing more idle time. We now have black boxes on deployed vehicles taking data continuously—almost a million miles of data thus far. ATC subject matter experts have been deployed eight times for specific issues. We are learning more about the effects of armoring tactical vehicles. It is neither the ideal way to learn nor the one we prefer, but it has provided critical information.

In another example of test support to rapid acquisition, the Joint Experimentation Range Complex (JERC) was established at the Yuma Proving Ground in late 2003 and early 2004. Its role (see “Featured Capability” in this edition, page 21) is to provide as realistic a representation as possible, portions of Afghanistan and Iraq, and to conduct rapid turnaround testing. Fourteen days after start of construction, sufficient roads and features were ready for testing to begin. The site currently encompasses more than 14 miles of roads and more than 240 buildings representing a wide range of urban and rural environmental features. It has supported the evaluation of more than 150 technologies that address the IED threat.

Adding rocket-propelled grenade (RPG) protection to the Stryker vehicles also required rapid response from the test and evaluation community. The slat armor concept was proposed, developed and tested for the Stryker over a single weekend by a team of ARL, DTC and ATC experts. ARL and ATC then worked for seven straight days and produced the first prototype. The process was to develop an idea, characterize the slat armor performance, brief Pentagon decision makers, obtain a go-decision, and proceed to test, develop and deploy. The first 25 kits were produced at ATC, and the PM subsequently sent the designs to the Lima tank plant to mass produce the variants for the different versions of the Stryker.

Rapid acquisition has been conducted in another way that differs from traditional testing. Initially for testing of armor proposals, instead of having a procurement action for every purchase and separate funding lines and contracts for every contractor, we created a standing budget to test proposals. When an idea came in the door from a vendor, we had immediate resources allowing the ideas to be documented and tested without establishing individual test programs and budgets for each test, ensuring very quick response. Initially that method allowed us to provide the quickest response.

In March 2006, another trip was taken to Iraq to look at the current threat and update the leadership on the capabilities and limitations of the existing kits. While in theater, a new armor vulnerability emerged, so an ATC armor expert was sent to theater. Over the period of one week, an interim fragmentation kit was developed, and funding was directed to field the kits—almost 6,000 of them are now installed. Today, more than 40,000 up armored tactical wheeled vehicles are in theater, compared to 300 in October 2003, and the threat is still evolving. ATEC remains ready to support the global war on terrorism in Iraq and Afghanistan or wherever needed.

At ATC, the desire is to make sure that the reality of the war is as close to us as it is to the soldiers in theater—to maintain urgency here for providing solutions there. Interim kits were deployed in March 2006, and report of the first hit on an interim kit was obtained in May—everyone walked away. That is the ultimate success of rapid acquisition. □

COL JOHN P. ROONEY, USA, assumed command of the U.S. Army Aberdeen Test Center, Aberdeen Proving Ground (APG), Maryland, in June 2005. Prior to this assignment, he was chief of staff, U.S. Army Developmental Test Command, APG, Maryland. He was commissioned as a second lieutenant in the Field Artillery upon graduation from the United States Military Academy in 1978. After attending the Field Artillery Officer Basic Course, he was assigned to Battery A, 3rd Battalion, 18th Field Artillery at Fort Sill, Oklahoma, where he served as battery fire direction officer and battery executive officer. He then assumed command of Service Battery, 3rd Battalion, 18th Field Artillery. He then attended the Field Artillery Officer Advanced Course. In 1982, he was assigned to 1st Battalion, 37th Field Artillery at Fort Richardson, Alaska, where he served as the battalion adjutant before assuming command of Battery B, 1st Battalion, 37th Field Artillery. COL Rooney was then assigned as assistant professor of military science at the University of Miami in Coral Gables, Florida, and attended the U.S. Army Command and General Staff College. At Fort Lewis, Washington, he served as the brigade fire support officer for the 199th Infantry Brigade (Motorized) and the 2nd Armored Cavalry Regiment; and as the battalion operations officer for 1st Battalion, 11th Field Artillery. He then reported to the Joint Staff, Washington, D.C., serving as assistant deputy director for operations, National Military Command Center, and subsequently as operations officer, U.S. Central Command Division, Joint Operations Division, J3. On assignment to Hawaii, he joined the 25th Infantry Division (Light), Schofield Barracks, as commander, 3rd Battalion, 7th Field Artillery. He then attended the U.S. Army War College, at Carlisle Barracks, Pennsylvania, and was subsequently assigned as director of the Fire Support Evaluation Directorate, U.S. Army Evaluation Center. He was then deputy chief of staff for operations of U.S. Army Test and Evaluation Command Headquarters, Alexandria, Virginia. COL Rooney's awards and decorations include the Legion of Merit Award, Defense Meritorious Service Medal, Meritorious Service Medal (with five Oak Leaf Clusters), Army Commendation Medal (one Oak Leaf Cluster), Global War on Terrorism Service Medal, Overseas Service Ribbon, Joint Meritorious Unit Award and the Parachutist Badge.